SOUTH CAROLINA Energy Office

Energy Briefs

Helping the Homeowner Live Energy Efficiently

Loose-Fill Insulations

Whether you are increasing the insulation levels in your current home or selecting insulation for a new home, choosing the right insulation material can be challenging. Fibrous loose-fill insulations such as cellulose, fiberglass and rock wool are options you may wish to consider. This publication will introduce you to these materials - what they are, how they are applied, how they compare with each other, and other considerations regarding their use - so you can decide whether loose fills are right for your home.

Character and Types of Loose-Fill Insulation

The most obvious difference between loose fills and other types of insulation is their form. They are either produced as or broken down into shreds, granules or nodules. These small particles form fluffy materials that conform to the spaces in which they are installed. Loose fills are most commonly sold in bags and are blown into building cavities using special equipment. All three primary types of loose-fill insulation are considered "environmentally positive" because recycled waste materials are used in their production.

Cellulose loose-fill insulation is made from wastepaper, such as used newsprint and boxes, which is shredded and pulverized into small, fibrous particles. Chemicals are added to provide resistance to fire and insects. Less energy is required to produce loose-fill cellulose than to produce other insulations.

Fiberglass loose-fill insulation is spun from molten glass into fibers. The glass is typically melted in high-temperature gas furnaces. Most major manufacturers use 20 to 30 percent recycled glass content.

Rock wool (or slag wool) loose-fill insulation is similar to fiberglass except that it is spun from blast furnace slag (the residue that forms on the surface of molten metal) and other rock-like materials instead of from molten glass. The production of rock wool uses by-products that would otherwise be wasted.

Primary Applications of Loose-Fill Insulations

Loose-fill insulations are well suited for places where it is difficult to install other types of insulation, such as irregularly shaped areas, around obstructions (such as plumbing stacks), and in hard-to-reach places. They can be installed either in enclosed cavities such as walls or in unenclosed spaces such as attics. Blown-in loose fills are particularly useful for retrofit situations because, except for the holes that are sometimes drilled for installation, they are one of the few materials that can be installed without greatly disturbing existing finishes. Rock wool or slag wool loose-fill insulation is often used for insulating existing walls and ceilings in mobile homes.

In most new construction, however, the more common choices in insulation are batts or rolls, since they can be installed before walls are finished without the use of special equipment. Batts are available in standard widths designed to match the cavities created by wall studs.

Loose fills are sometimes used in new construction, though. A mixture of loose-fill insulation and an adhesive can be sprayed into wall cavities before the walls are closed. Such methods may result in fewer gaps in the building's thermal envelope than can occur with batts.

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of the currently available "convection blanket" products that can inhibit this convective heat loss.

Cellulose and rock wool are more resistant to airflow than fiberglass because they are denser. They may also be more effective at reducing air leakage and associated heat loss, because their higher densities cause them to settle and seal more around rafters and in corners.

Sprayed-in-place foam insulations are an alternative to loose fills in some applications. They offer higher R-values at lower thicknesses than loose fills and, when properly installed, can help stop air leakage.

But no insulation, by itself, provides an effective air retarder because it cannot completely block airflow. Installing an air retarder along with your insulation and using caulking and weatherstripping seals all gaps and greatly reduces air infiltration into your home (see the section on Air Retarders that follows).

Settling and Loss of Insulating Capacity

Many loose-fill insulations installed in attic cavities will lose some of their installed R-value over time because of settling. Cellulose loose fill settles more than rock wool or fiberglass loose fill - about 20 percent compared to roughly 2 to 4 percent. Therefore, install about 20 percent more blown-in cellulose insulation to offset this settling. Cellulose manufacturers are required by federal law to state "settled thickness" on their bags. Because this can be confusing to consumers, many cellulose producers also specify "installed thickness" on their bags. Regardless, installed thickness can be estimated by adding 20 percent to the stated settled thickness, but be sure not to exceed previously mentioned weight limits. Most name brand labels already take into account the settling effect.

Researchers say that it is possible to install loose-fill insulations in wall cavities without settling. If the cavity is completely filled with insulation at the proper density, no significant settling should occur. A general density guideline for walls is roughly 3.5 pounds per cubic foot of wall cavity for cellulose and 1.5 pounds per cubic foot for fiberglass or rock wool. These specifications are roughly twice the density of horizontal applications.

One expert suggests this easy-to-follow guideline to ensure that wall cavities are being filled at a density sufficient to prevent settling. Use roughly one 30-pound bag of cellulose or about 15 pounds of fiberglass or rock wool for every three wall cavities you fill. (Assumptions: 8-foot walls, with 16-inch on center wall cavities, and 2x4-inch framing studs.)

Fire Resistance

Loose-fill insulations offer very good resistance to fire. Although fiberglass and rock wool are naturally fire resistant, cellulose's fire resistance is achieved by adding chemicals. To ensure that it does not present a fire hazard, cellulose must pass tests established by the Consumer Product Safety Commission.

Moisture Resistance

The average household generates a considerable amount of water vapor each day through activities such as cooking, laundry and bathing. This vapor migrates into insulated cavities and, if it reaches the dew point (the air temperature at which water vapor cools enough to condense), it converts to liquid within the insulation. This reduces the insulation's effective R-value.

All loose-fill insulations are permeable to water vapor. Permeability is the extent to which water vapor can pass through a given material. Fiberglass and rock wool absorb about 1 percent of their weight, and cellulose absorbs 5 to 20 percent of its weight. However, any insulation can absorb large amounts of water if exposed to extremely high humidity.

Higher levels of outdoor moisture can also penetrate into insulated cavities. If your roof leaks, for example, moisture can accumulate in the attic cavity and wet the insulation to the point that it mats and compacts. Enough moisture penetration could even cause the ceiling to sag.

If insulation is saturated only one time, it will eventually dry and regain most of its original R-value. However, loose-fill insulations that are repeatedly saturated will lose much of their R-value. Moisture also causes additional problems such as mold and mildew growth.

See the Vapor Retarders section that follows for steps you can take to ensure that moisture does not create a problem in your insulation.

the perm rating of a material, the more moisture can pass through it. An air retarder should have a high perm rating because this allows the escape of moisture that may have migrated into insulated cavities. In new construction, an air retarder (such as "housewrap" products) is often wrapped around the outside walls before installing the exterior finish, and a vapor retarder is installed around the inside walls before the interior finish is completed.

Installation

Loose-fill insulations are typically installed with special equipment that blows the insulation through a hose and into the cavity. Although loose fills can be installed in both new and retrofit situations, they are especially popular for retrofit projects because they can be installed with minimal disturbances to existing finishes.

Exterior wall installation often calls for the "two-hole method," which entails drilling two holes spaced vertically between the exterior walls' framing studs. The holes should be 2 inches in diameter. Working between each stud, drill one hole 16 inches from the top of the wall. Drill the other hole 24 inches from the bottom of the wall. The insulation is blown into the holes, then the installation holes are sealed. Installation is most commonly done by professionals who are experienced at operating the equipment to ensure proper density and complete coverage. In conventional and cathedral ceilings, insulation is easier to blow in if an access opening through the ceiling already exists. Otherwise, it may be necessary to drill holes in the ceiling or between the roof rafters.

Cost

At the time this publication was written, the average loose-fill insulation cost per R-value per square foot was about 0.8 cents for cellulose and rock wool and 1.1 cents for fiberglass. These prices were for materials only. The average installed price per R-value per square foot was about 1.2 cents for blown-in cellulose and rock wool and 1.3 cents for fiberglass. Because prices vary in different regions, obtain bids from several insulation contractors or suppliers to determine the specific cost in your area.

Installation Quality Control

Voids and Gaps

To ensure quality installation, there are several things to watch out for when installing loose-fill insulation - whether you do the job yourself or hire a professional.

You may create undesirable voids or gaps if you install the insulation at too low a density or if you do not completely fill the cavity. Voids are most likely to occur at the top of wall cavities, above windows, around doorways, and in the corners of ceiling cavities. Voids also occur if the installation holes are improperly located between the vertical framing studs or if there are too few fill holes. Keep in mind, though, that installers' practices may vary regarding the number, location and size of installation holes.

It may be difficult to achieve recommended R-values with loose-fill insulation in the eave area of the attic. Do not insulate the soffit area, and always leave a one inch space between the insulation and the roof deck in the eave areas.

Fluffing

"Fluffing" occurs when insulation is installed to minimum thickness but not to minimum weight requirements. The result is a less dense application of insulation that requires fewer bags. When insulation is "fluffed," air passes more easily through it. This means increased heat loss. Additionally, the fluffed loose-fill insulation will eventually settle and result in a thinner layer with a lower overall R-value. Fiberglass is more "fluffable" than cellulose or rock wool.

Intentional fluffing by unscrupulous contractors has been a problem in some parts of the country. To avoid these problems, compare bids from several contractors to see how many bags they specify. Count the number of bags used during installation, either by you or a contractor, and compare it to the instructions on the bag. The manufacturer should specify the amount of insulation required to obtain a particular R-value per square foot of space.

Safety and Health Concerns

Safety Guidelines

Insulation blown into your ceiling cavities should cover the top plate of the wall, but be sure the eave vents are not covered. These vents provide necessary ventilation to your attic, and covering them could result in severe moisture problems.

Electrical devices and recessed lights (except "IC-rated" fixtures) require 3 inches of clearance from insulation.

Pipes for kitchen stoves, wood stoves, and furnaces should only be insulated with fiberglass or rock wool because cellulose may smolder if flue temperatures become hot enough.